

WHAT IS CLAIMED IS:

1 1. A piezoelectric element formation member, comprising:

2 a substrate, in which first internal electrode layers and second internal
3 electrode layers are alternately laminated while sandwiching piezoelectric
4 material layer therebetween, the first internal electrode layers being exposed to
5 a first end face of the substrate, and the second internal electrode layers being
6 exposed to a second end face of the substrate which is opposite to the first
7 end face;

8 a first external electrode layer formed on the first end face and a third
9 end face connecting the first end face and the second end face, the first
10 external electrode layer being electrically connected to the first internal
11 electrode layers; and

12 a second external electrode layer formed on the second end face and
13 the third end face, the second external electrode layer being electrically
14 connected to the second internal electrode layers, and being electrically
15 independent from the first external electrode layer, wherein:

16 the first external electrode layer and the first internal electrode layers
17 are to be divided by slits extending from the first end face to form a plurality of
18 piezoelectric elements arrayed in a first direction; and

19 the second external electrode layer includes:

20 a pair of first sections provided on both end portions of the third end
21 face in the first direction, and having a first dimension in a second direction
22 perpendicular to the first direction; and

23 a second section provided between the first sections, and having a

24 second dimension in the second direction which is less than the first
25 dimension.

1 2. The piezoelectric element formation member as set forth in claim 1,
2 wherein the second dimension is substantially zero.

1 3. The piezoelectric element formation member as set forth in claim 1,
2 wherein a dimension of the second section in the first direction is greater than
3 a dimension in the first direction of a region where the first external electrode
4 layer is formed.

1 4. The piezoelectric element formation member as set forth in claim 1,
2 wherein the first sections and the second section are connected in a stepwise
3 manner.

1 5. The piezoelectric element formation member as set forth in claim 1,
2 wherein the first sections and the second section are connected by third
3 portions each dimension in the second direction of which is gradually varied
4 from the first dimension to the second dimension.

1 6. A method of manufacturing a piezoelectric element formation member,
2 comprising steps of:

3 preparing a substrate, in which first internal electrode layers and
4 second internal electrode layers are alternately laminated while sandwiching
5 piezoelectric material layer therebetween, the first internal electrode layers

6 being exposed to a first end face of the substrate, and the second internal
7 electrode layers being exposed to a second end face of the substrate which is
8 opposite to the first end face;

9 placing a mask on a third end face of the substrate which connects
10 the first end face and the second end face; and

11 depositing conductive material on the masked substrate such that a
12 first external electrode layer is formed on the first end face and the third end
13 face, and a second external electrode layer is formed on the second end face
14 and the third end face, and such that the second external electrode layer is
15 made electrically independent from the first external electrode layer, wherein:

16 the first external electrode layer and the first internal electrode layers
17 are to be divided by slits extending from the first end face to form a plurality of
18 piezoelectric elements arrayed in a first direction; and

19 the mask is configured such that the second external electrode layer
20 includes:

21 a pair of first sections provided on both end portions of the third end
22 face in the first direction, and having a first dimension in a second direction
23 perpendicular to the first direction; and

24 a second section provided between the first sections, and having a
25 second dimension in the second direction which is less than the first
26 dimension.

1 7. The manufacturing method as set forth in claim 6, wherein the mask
2 is configured such that the second dimension is substantially zero.

1 8. The manufacturing method as set forth in claim 6, wherein the mask
2 is configured such that a dimension of the second section in the first direction
3 is greater than a dimension in the first direction of a region where the first
4 external electrode layer is formed.

1 9. The manufacturing method as set forth in claim 6, wherein the mask
2 is configured such that the first sections and the second section are connected
3 in a stepwise manner.

1 10. The manufacturing method as set forth in claim 6, wherein the mask
2 is configured such that the first sections and the second section are connected
3 by third portions each dimension in the second direction of which is gradually
4 varied from the first dimension to the second dimension.

1 11. The manufacturing method as set forth in claim 6, wherein the mask
2 is configured such that a plurality of piezoelectric formation members each of
3 which is as set forth in claim 6 are simultaneously formed.

1 12. A piezoelectric actuator unit, wherein a fourth end face opposite to the
2 third end face of the piezoelectric element formation member as set forth in
3 claim 1 is joined to a fixation board in a cantilevered manner, such that a
4 portion of the piezoelectric element formation member closer to the first end
5 face becomes a free end.

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1 13. The piezoelectric actuator unit as set forth in claim 12, wherein the
2 slits are extended to at least an end of the first external electrode layer formed
3 on the third end face and closer to the second end face.

1 14. A liquid ejection head, comprising:
2 the piezoelectric actuator unit as set forth in claim 12;
3 a drive wiring, comprising a plurality of electrodes electrically
4 connected, through contacts, to the divided ones of the first external electrode
5 layer and the second external electrode layer, to supply signals for driving the
6 piezoelectric elements; and
7 a vibration plate, which forms a part of each of pressure generating
8 chambers communicated with a nozzle orifice from which an ink droplet is
9 ejected,
10 wherein the second external electrode layer is electrically connected
11 to at least two of the electrodes in the drive wiring via the first sections thereof.